was assessed by the correlation between echo parameters and clinical 6MWD and ROC analysis.
Results: 58 patients with RHC measured SPAP 73.0±23.6mm Hg, DPAP 39.0±13.0mm Hg, MPAP 51.7±15.4mm Hg, PVR 11.6±5.3wood units and CO 4.0±1.3L/min, were given targeted therapies as bosentan (n=18), ambrisentan (n=7), sildenafil (n=13), vardenafil (n=17), tadalafil (n=9), beraprost (n=12) and iloprost (n=1). 17 patients died and 1 performed lung transplantation during the total duration of 30.24±18.46 months' (range 6 to 70 months) follow-up. The left/right ventricular diastolic dysfunction (LVDD/RVDD) score measured by 2D-echo had a good correlation with 6MWD at baseline (r_{LVDD}=-0.699, P<0.001; r_{RVDD}=-0.818, P<0.001) and 6MWD at last follow-up (r_{LVDD}=-0.701, P<0.001; r_{RVDD}=-0.666, P<0.001). Furthermore, bi-ventricular scores (LVDD score + RVDD score) measured by 2D-echo had a better correlation with 6MWD at baseline and last follow-up (r=-0.831, P<0.001; r=-0.771, P<0.001). The correlation between right ventricular parameters (RVEDV, RVESV, RVSV and RVEF) measured by 3D-echo and 6MWD had a statistical significance in the last follow-up (r=-0.556, P<0.001; r=-0.756, P<0.001; r=-0.549, P<0.001; r=-0.847, P<0.001). Receiver operating characteristic (ROC) curve showed that the area under curve (AUC) of LVDD score, RVDD score and (LVDD + RVDD) score were 0.823 (P<0.0001), 0.737 (P=0.0002), and 0.825 (P<0.0001) respectively. Compared with ROC analysis of other single parameters, cardiac diastolic function score was more accurate to predict survival of patients with PAH.
Conclusions: Single ventricular diastolic function score was superior to single parameter measured by 2D-echo to predict clinical prognosis in patients with PAH. And the bi-ventricular diastolic function score was better than single ventricular diastolic function score to predict clinical outcomes in patients with PAH. Contrast to routine echo parameters such as TAPSE, Tei, FAC, 3D-echo was superior to 2D-echo to evaluate right ventricular function. Cardiac diastolic function score was more accurate to predict survival of patients with PAH.

GW25-e1624

Delayed-enhancement MRI using low-dose contrast for the assessment of myocardial infarction

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Objectives: A recent multicenter study shows delayed-enhanced magnetic resonance imaging (DE-MRI) using contrast doses of ≥0.2 mmol/kg is effective in the assessment of myocardial infarction (MI), and 0.1 mmol/kg is not enough; intermediate doses between 0.1 and 0.2 mmol/kg have not been tested. The aim of this study was to prospectively test the performance of DE-MRI using 0.15 mmol/kg of contrast agent for the detection of MI.
Methods: A total of 27 consecutive patients with chronic MI underwent DE-MRI using both 0.15 mmol/kg and 0.2 mmol/kg of contrast agent in random order and on separate days. Infarction segment and infarction size were compared on DE-MRI images using a 17-segment model. Bland-Altman analysis was used to analyze correlation and agreement between global infarct size.
Results: DE-MRI showed enhanced myocardium in all the 27 patients with chronic MI. There was no significant difference between the 0.15 mmol/kg and 0.2 mmol/kg images in all 27 patients based on the infarction segment (7.88±2.75 vs 7.83±2.55, respectively; P>0.05). There was no significant difference between the infarction size obtained from 0.15 mmol/kg acquisition and that from 0.2 mmol/kg acquisition (16.2%±7.7% vs 16.3%±7.8%, respectively; P>0.05). A strong correlation between the infarction size obtained from 0.15 mmol/kg acquisition and that from 0.2 mmol/kg acquisition was indicated through Bland-Altman analysis.
Conclusions: DE-MRI using 0.15 mmol/kg of contrast agent is effective for the assessment of MI.

GW25-e2157

Evaluation of fetal cardiac structure and function of gestational diabetes mellitus by Echocardiography

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Objectives: To investigate the influence of gestational diabetes mellitus (GDM) on fetal cardiac structure and function.
Methods: 96 pregnancies of well controlled GDM with 71 pregnancies with diet control and 25 pregnancies with insulin treatment and the same period 176 normal pregnancies were studied. All the fetuses were divided into 2 groups: <28, ≥28 weeks. The inner diameters of atrioventricular cavity, ventricular cavity, aorta and pulmonary artery were measured by two-dimensional ultrasound. The peak blood flow velocity of each valve orifice were measured by pulse doppler waveforms. M mode was obtained with afterprocessing of STIC. The thickness of ventricular wall and interventricular septal were measured with M mode. The end of systolic and diastolic ventricular volume were measured with afterprocessing of STIC. The left and right ventricular SV, EF and CO were calculated. The early diastolic velocity (Ea) and late diastolic velocity (Aa) of mitral annulus and tricuspid annulus were obtained by TDI.In the meantime, isovolumic contraction time (ICT), isovolumic relaxation time (IRT) together with ejection time (ET) were also acquired. The index of left and right ventricular Tei were calculated. The fetal cardiac function of GDM and normal pregnancy were compared.
Results: There was no statistics difference on all the parameters before 28th week of pregnancy. After 28th weeks of pregnancy, there was a significant increase in ventricular walls and interventricular septal thickness in GDM with insulin treatment compared with normal pregnancies. After 28th weeks of pregnancy, Ea/Aa of tricuspid annulus were smaller in GDM with insulin treatment than that of diet control. There was no difference of other parameters in GDM group with that of normal group.
Conclusions: Gestational diabetes mellitus affect fetal heart mainly in the third pregnancy. After 28th weeks of pregnancy, there was a significant increase in ventricular walls and interventricular septal thickness in GDM with insulin treatment compared with normal pregnancies. The diastolic function is mainly impaired. The diastolic function of right ventricle was lower in GDM with insulin treatment compared with pregnancies with diet control.

GW25-e2470

Increased longitudinal contractility and diastolic function at rest in well-trained amateur Marathon runners: a speckle tracking echocardiography study

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Objectives: Regular physical activity reduces cardiovascular risk. There is concern that Marathon running might acutely damage the heart. It is unknown to what extent intensive physical endurance activity influences the cardiac mechanics at resting condition.
Methods: 84 amateur marathon runners (43 women and 41 men) from Berlin-Brandenburg area who had completed at least one marathon previously underwent clinical examination and echocardiography at least 10 days before the Berlin Marathon at rest. Standard transthoracic echocardiography and 2D strain and strain rate analysis were performed. The 2D Strain and strain rate values were compared to previous published data of healthy untrained individuals.
Results: The average global longitudinal peak systolic strain of the left ventricle was 23%±2% with peak systolic strain rate 1.39±0.21/s, early diastolic strain rate 2.0±0.40/s and late diastolic strain rate 1.21±0.31/s. These values are significantly higher compared to the previous published values of normal age-adjusted individuals. In addition, no age-related decline of longitudinal contractility in well-trained athletes was observed.
Conclusions: There is increased overall longitudinal myocardial contractility at rest in experienced endurance athletes compared to the published normal values in the literature indicating a preserved and even supra-normal contractility in the athletes. There is no age dependent decline of the longitudinal 2D Strain values. This underlines the beneficial effects of regular physical exercise even in advanced age.

GW25-e3388

Three-Dimensional Rotation, Twist and Torsion Analyses by Real-time 3-D Speckle Tracking Imaging: Feasibility, Reproducibility, and Normal Ranges in Pediatric Population

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Objectives: The aims of this study were to evaluate the feasibility and reproducibility of LV rotation, twist and torsion by real-time 3D speckle-tracking echocardiography (STE) in children and to establish their normal values.
Methods: A prospective study was conducted in 347 consecutive healthy subjects (181 male/156 female, and range from birth to 18 years) using RT 3-D echocardiography (3DE). The LV rotation, twist and torsion measurements were made off-line using new TomTec software. Manual landmark selection and endocardial border editing were performed in 3 planes (apical 2-, 4-, and '3-' chamber views) and semi-automated border identification and tracking yielded LV rotation, twist and torsion measurements.
Results: LV rotation, twist and torsion analysis by RT 3D-STI was feasible in 307 of 347 subjects (88.5%). There is no correlation between rotational or twist and age, height, weight, BSA or HR, respectively, using canonical correlation analysis. However, there is a negative correlation between age and LV torsion (P< 0.001). The normal ranges were defined in this cohort for rotation and twist, and for each age group for torsion. The intraobserver and interobserver variabilities for apical and basal rotation, twist and torsion ranged from 7.3%±3.8% to 12.3%±8.8% and from 8.8%±4.6% to 15.7%±10.1%, respectively. Interclass correlation coefficients ranged from 0.78 to 0.89 and from 0.76 to 0.83 for intraobserver and interobserver measurements for rotation, twist and torsion, respectively.
Conclusions: Analyses of LV rotation, twist and torsion by this new RT3D STI methodology are feasible and reproducible in pediatric population.

GW25-e3473

In vivo quantification of VCAM-1 expression in atherosclerosis model using non-invasive targeted ultrasound imaging

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Objectives: Vascular cell adhesion molecule-1 (VCAM-1) is upregulated in the initiation and progression of atherosclerosis. We hypothesized that contrast-enhanced

ultrasonography (CEU) targeting VCAM-1 might allow the molecular imaging of VCAM-1 expression in a rabbit model of atherosclerosis.
Methods: Atherosclerotic lesions were induced by highcholesterol diet in 20 male New Zealand white rabbits. CEU molecular imaging for aortic endothelial VCAM-1 expression was performed with VCAM-1-targeted (MBVCAM) and control microbubbles (MBCtr). Histology, immunohistology and real time qPCR were used to assess plaque burden and VCAM-1 mRNA expression.
Results: In the atherosclerosis group, the peak signal intensity of targeted microbubbles increased compared with the control group (29.99±2.55 vs 0.05±24.61±2.25, $P<0.01$). Retention of VCAM-1 targeted microbubbles was significantly higher than retention of nontargeted microbubbles1 (21.56±1.12 vs 15.24±1.02, $P<0.01$). VCAM-1 mRNA expression in atherosclerosis group was 60-fold higher than in control group (3.08±0.61 vs 0.05±0.02, $P<0.001$). In addition, the PSI of abdominal wall enhancement detected with ultrasound after injection of VCAM-1 targeted contrast agent highly correlated with indeed VCAM-1 mRNA expression measured in corresponding abdominal segments using real time qPCR ($r=0.865$, $P<0.001$).
Conclusions: VCAM-1 targeted CEU can detection and quantification of VCAM-1 expression in an experimental atherosclerotic model. This easily accessible, low-cost technique may be useful in assessing treatment effects in preclinical research and in patients.

GW25-e3542

The Experimental study of noninvasive evaluation of vascular phantom Elasticity with ultrasound radiofrequency-data technique

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Objectives: As a novel, noninvasive vessel wall tracking technique, ultrasound radiofrequency (RF)-data technique has been used preliminary for evaluating artery wall elasticity in clinic, which has potential for detecting early stage atherosclerosis. This objective was to investigate the feasibility and accuracy of ultrasound RF-data technique for detecting the vessel wall elasticity by vascular phantom experiment.
Methods: Five standard-unified vascular phantoms were manufactured, and the mechanical stiffness of phantom wall was designed as 35HA, 40HA, 45HA, 50HA and 55HA, respectively. A closed-ring compression system was built, which was similar to human circulatory system. And then the phantom wall elastic parameters including compliance coefficient (CC), distensibility coefficient (DC), α stiffness (α), β stiffness (β) and single point pulse wave velocity (PWV) were calculated automatically by ultrasound RF-data technique. Every vascular phantom was measured three times repeatedly, and the mean value was used for further analysis.
Results: Mechanical stiffness of vascular phantoms correlated with DC ($r=-0.962$, $P<0.01$), α ($r=0.984$, $P<0.01$), β ($r=0.985$, $P<0.01$), PWV ($r=0.978$, $P<0.01$) and CC ($r=-0.805$, $P>0.01$). With the mechanical stiffness of vascular phantoms increase, the mean value of elastic parameters measured by ultrasound RF-data technique were (1) 0.030±0.010 kPa^{-1}, 0.027±0.006 kPa^{-1}, 0.017±0.006 kPa^{-1}, 0.010±0.000 kPa^{-1} and 0.010±0.000 kPa^{-1} for DC, (2) 0.923±0.220 mm^2/kPa, 0.593±0.105 mm^2/kPa, 0.437±0.106 mm^2/kPa, 0.540±0.079 mm^2/kPa and 0.443±0.116 mm^2/kPa for CC, (3) 3.156±1.118, 3.627±0.641, 5.743±1.004, 6.830±0.135 and 7.797±0.263 for α, (4) 6.467±2.209, 7.440±1.274, 11.663±1.995, 13.873±0.337 and 15.760±0.521 for β, (5) 5.663±0.951m/s, 6.217±0.508m/s, 7.793±0.695m/s, 8.683±0.460m/s and 9.030±0.234 m/s for PWV.
Conclusions: Ultrasound RF-data technique can distinguish the variation tendency of vascular phantoms with different mechanical stiffness. It is feasible for evaluating artery wall elasticity in clinic, and it is hopeful to reflect early atherosclerosis.

GW25-e4205

Prognostic significance of myocardial fibrosis quantification by noninvasive imaging techniques in patients with cardiovascular disease

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Objectives: This study was to evaluate the prognostic significance of noninvasive imaging techniques for the prediction of myocardial fibrosis (MF) in patients with cardiovascular disease.
Methods: The clinical literatures related with the noninvasive detection of MF were taken as the object of study with the application of basic research method of literature review.
Results: Recent reports demonstrated the evaluation of MF focus on secure and noninvasive imaging techniques have further pushed our ability to accurately and precisely analyze myocardial tissue composition, especially MF content. In this paper we present as follows: (1) cardiovascular magnetic resonance (CMR): CMR has emerged as a noninvasive imaging technique that may uniquely characterize the extent of replacement fibrosis and have prognostic value in various cardiomyopathies. T1 mapping and extracellular volume mapping (ECV) combined with CMR are methods that have the potential to assess interstitial MF. The use of CMR with late post-gadolinium myocardial enhancement (LGE) is an emerging technique that could improve CMR's diagnostic accuracy, especially for interstitial diffuse myocardial fibrosis and present as an important risk-stratifying investigation in dilated cardiomyopathy (DCM) patients. Although LGE-CMR is the most accurate method to measure MF that could be integrated in the monitoring and therapeutic management of a large number of patients, while its sensitivity is limited for the assessment of diffuse interstitial fibrosis. (2) Computed Tomography (CT): By using a relatively low-radiation-dose method, ECV values for cardiac CT were shown good reproducibility, representing a potential new approach toward the clinical assessment of diffuse myocardial fibrosis. While cardiac CT were not available at the time of protocol development. Another reports showed that 3D ECV fraction by low-radiation dose cardiac CT may be a potential and useful noninvasive marker of fibrosis suggesting the novel assessment for myocardial tissue characterization. (3) Nuclear imaging techniques: Nuclear imaging techniques [i.e. single photon emission computed tomography (SPECT) and positron emission tomography (PET)] have been the main molecular imaging modalities based on the use of molecular probes in very low concentrations within a living organism of MF at the molecular and cellular level and also seen as a potentially attractive clinical tool to provide early diagnosis and individual risk assessment of MF. Another imaging modalities for Molecular imaging could be MRI, CT, Ultrasound, Optical imaging. (4) Ultrasound: Ultrasonic myocardial tissue characterization by integrated backscatter (IBS) has been used for the differentiation between various myopathies and normal myocardium. 2DS is a new echocardiographic technology that is based on grey scale B-mode images, and allows angle-independent assessment of myocardial function. It provides images at real time and facilitates evaluation of different components of complex cardiac motions which can be readily used in clinical practice. Both of 2DS and IBS were used to evaluate LV reverse remodelling in patients with non-ischaemic dilated cardiomyopathy (DCM).
Conclusions: This review summarizes the advantages and limitations of noninvasive imaging techniques for the assessment of myocardial fibrosis. We still need to establish a comprehensive evaluation method which can provide important insight into accurate-early diagnosis and elaborate mechanisms of MF.

GW25-e4258

Altered left ventricular torsion and function during normal pregnancy

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Objectives: Left ventricular torsion and subsequent untwisting, the helical twisting and untwisting motion of the LV about its longitudinal long axis, play an important role in myocardial contractility and structure. Alterations in left ventricular twist and untwist have been described for a variety of physiologic and pathologic conditions. During pregnancy, the cardiovascular system adapts to the metabolic needs of mother and fetus. The effects of this adaptation on left ventricular torsion and untwist have not been well documented. The aim of this study was to evaluate the LV torsional mechanics during normal pregnancy.
Methods: 2D speckle tracing imaging were performed in 80 woman, aged (mean±SD) 32.4±4.6 years at gestational weeks 14-16, 16-24, 36, and 6 months postpartum. LV torsion was defined as apical rotation relative t o the base.LV rotation, Left ventricular rotations were obtained at basal and apical short-axis levels, untwisting rate and untwisting rate in IVRT were also measured.
Results: (1) Cardiac output and LV end-diastolic volume were on average 20% and 23%higher, respectively, during pregnancy; (2) Analysis of LV torsional behavior revealed that compared to that 6 months postpartum (12.69±2.9), there was a significant increase in peak LV twist from14-16weeks (12.38±2.7); 16-24 weeks (13.21±3.2) to 36 weeks (15.67±3.9) (all $P<0.05$). (3) Changes of LV untwist behavior revealed there was a significant increase in LV untwisting rate during pregnancy (118.34±28.89°/sec, 109.76±23.53°/sec, 154.43±48.28°/sec) compared to that 6 months postpartum (112.73±27.94°/sec), but untwisting rate in IVRT was decreased during pregnancy compared to that 6 months postpartum ($P<0.05$) (all $P<0.05$). (4) Multiple linear regression analysis showed that: the change in LV end-systolic volume was independently associated with the change in twist (β=-0.19, SE=0.08, P=0.02); the change in stroke volume was the only independent factor associated with the change in untwisting rate (β=-0.37, SE=0.65, P=0.047).
Conclusions: There are significant changes in LV torsional indices during normal pregnancy, whereas LV twist and peak untwisting rate increase and correlate with end-systolic and stroke volume, respectively.

GW25-e5344

Improvement of left ventricular myocardial perfusion after acidic fibroblast growth factor delivered by using ultrasound-targeted microbubble destruction in diabetic cardiomyopathy in rats: an preliminary study

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Objectives: To investigate the protective effects of left ventricular myocardial perfusion after delivery of acidic fibroblast growth factor (aFGF) in diabetic cardiomyopathy (DCM) in rats by using ultrasound-targeted microbubble destruction (UTMD) with real-time myocardial contrast echocardiography (RT-MCE).
Methods: Among 52 male SD rats, forty rats were randomly selected and were induced to be DCM models by streptozotocin through intraperitoneal injecting. The other rats as normal control group. DCM rats were randomly divided into the DCM model group, aFGF only group and the SonoVue-aFGF+UTMD group in this study. The aFGF only group rats were injected with aFGF solution through tail vein and the SonoVue-aFGF+UTMD group rats were injected with